AF/2152

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANTS:	Birkhoelzer et al.	CONFIRMATION NO. 7671
SERIAL NO.:	09/992,974	GROUP ART UNIT: 2152
FILED:	November 19, 2001	EXAMINER: Ramsey Rafai
TITLE:	"MEDICAL SYSTEM ARCHITECTURE WITH A WORKSTATION AND A CALL SYSTEM"	

MAIL STOP APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

REQUEST TO APPLY PREVIOUS-PAID FEE ACCOMPANYING FILING OF PREVIOUS APPEAL BRIEF TO THE FILING OF THE APPEAL BRIEF SUBMITTED HEREWITH

S I R:

In connection with the above-referenced application, Appellants filed an Appeal Brief on April 12, 2006, which was accompanied by a check for the requisite fee in the amount of $500.00. Appellants thereafter filed a Request for Continued Examination (RCE) on May 2, 2006, and Appellants thereafter received a Final Rejection and thus renewed the appeal, by filing a Notice of Appeal on December 1, 2006.

The Appeal Brief for the renewed appeal is filed simultaneously herewith, and Appellants request that the previously-paid fee in the amount of $500.00 be applied to this simultaneously filed Appeal Brief.

Appellants see no reason why the present Request should not be granted, however, should this Request be denied, the Commissioner is authorized to charge Deposit Account No. 501519 for the fee in the amount of $500.00. A duplicate copy of this sheet is attached.

Submitted by,

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CERTIFICATE OF MAILING

I hereby certify this correspondence is being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on January 26, 2007.

Steven H. Noll

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APPELLANT'S APPEAL BRIEF

S I R:

Pursuant to 37 C.F.R. §41.37, Appellants herewith submit their main brief in support of the appeal of the above-referenced application.

REAL PARTY IN INTEREST:

The real party in interest is the assignee of the present application, Siemens Aktiengesellschaft, a German corporation.

RELATED APPEALS AND INTERFERENCES:

There are no related appeals and no related interferences.

STATUS OF CLAIMS:

Claims 1-22 are the subject of the present appeal, and constitute all pending claims of the application. No claims were added or cancelled during prosecution before the Examiner.

STATUS OF AMENDMENTS:

No Amendment was filed following the Final Rejection dated June 26, 2006.

SUMMARY OF CLAIMED SUBJECT MATTER:

The claims on appeal concern a medical system architecture of the type initially described wherein call system linked into the medical workflow for the transmission of messages, for example as datafiles, is allocated to at least one of the workstations. The user of a medical workstation, for example a modality, can send digital messages to an expert in an electronic manner proceeding from the console of the workstation. The medical modalities can be, for example, an MR, CT, ultrasound, X-ray or angiography device, a nuclear camera, supervision monitor, diagnostic workstation or irradiation apparatus. An automated expert call system to a mobile communication device proceeding from a workstation is thus obtained that is integrated into the work and data context of the medical workstation. Due to the combination of the workstation with a call system, a completely new application scenario arises wherein the radiologist — as an expert — is available by retrieval. This application scenario has not been realizable with the previous means (for example, image transfer to workstations). (p.2, l.22 -p.3, l.11)

Claim 1 (the only independent claim of the application) is set forth below, with exemplary citations to the specification and drawings for the claim elements.

1. A medical system architecture comprising:

an imaging modality for acquiring medical examination images of an examination subject (any of CT unit 1, MR unit 2, DSA unit 3, x-ray unit 4, Fig. 1, p.5, l.3-8);

a workstation selected from the group of workstations consisting of workstations for acquiring said examination images (any of workstations 5-8; Fig. 1, p.5, l.8-11), workstations for sending said

examination image (also any of workstations 5-8) p. 5, l.12-17), and workstations for receiving said examination images (viewing workstations 11; Fig. 1, p.5, l.18-24);

a system connected to said workstation for transmitting said medical examination images to at least one location remote from said workstation (communication network 9; Fig. 1, p.5, l.12-14); and

a call system allocated to said workstation for transmitting messages together with data representing said medical examination images to a remote location (Fig. 2, p.6, l.17-23 and Fig. 3, p.7, l.3 -10).

Figure 1 shows the system architecture of a hospital network as an example. The modalities 1 through 4 serve for the acquisition of medical images; these can be, for example, a CT unit 1 for computed tomography, an MR unit 2 for magnetic resonance imaging, a DSA unit 3 for digital subtraction angiography and an X-ray unit 4 for digital radiography 4 as image-generating systems. (p.5, l.4-8) Operator consoles (workstations) 5 through 8 of the modalities are connected to these modalities, the acquired medical images being processed and locally stored therewith. Patient data belonging to the images also can be entered. (p.5, l.8-11)

For linking to a PACS, the operator consoles 5 through 8 are connected to a communication network 9, such a LAN/WAN backbone for distributing the generated images and for communication. (p.5, l.12-14) Thus, for example, the images generated in the modalities 1 through 4 and the images that are further-processed in the operator consoles 5 through 8 can be stored in a central image storage and image archiving system 10 or can be forwarded to other workstations. (p.5, l.14-17)

Further viewing workstation represented by a workstation 11 are connected to the communication network 9 as diagnostics consoles that have local image memories. For example, such a viewing workstation 11 is a very fast mini computer on the basis of one or more fast processors. (p.5, l.18-21) The images that are acquired and deposited in the image archiving system can be subsequently called in the viewing workstation 11 for diagnosis and can be deposited in the local image memory, from which they can be immediately available to the diagnostician working at the viewing workstation 11. (p.5, l.21-24)

Further, servers 12, for example patient data servers (PDS), file servers, program servers and/or EPR servers, are connected to the communication network 9. (p.6, l.1-2)

The image and data exchange via the communication network 9 ensues according to the DICOM standard, an industry standard for the transmission of images and further medical information between computers, so that a digital communication between diagnosis and therapy devices of different manufacturers is possible. (p.6, l.3-6) A network interface 13 via which the internal communication network 9 is connected to a global data network, for example the world wide web, can be connected to the communication network 9, so that the standardized data can be exchanged with different networks world-wide. (p.6, l.6-10)

A communication server 14 that coordinates the sending and the reception of the messages is connected to the communication network 9. A communication system 15, for example a transmitter that transmits the messages to a communication device (not shown in Figure 1) is connected to the communication server 14. The communication system 15 can be a radio transmitter, a number of

infrared transmitters or, for example, more complex components of a mobile radiotelephone network. (p.6, l.1-2)

Figure 2 shows a workstation 16 of an operator console 5 through 8 of one of the modalities 1 through 4 or of a viewing workstation 11, for example the operator console 6 of the MR unit 2. (p.6, l.17-19) A communication window 18, which shall be described in greater detail with reference to Figure 3, is mixed in on the monitor 17 of the workstation 16 as a user front end. (p.6, l.19-21) The message that can be entered in this communication window 18 is transmitted, for example as a datafile, to a communication service 19 that can be composed of the communication server 14 and the communication system 15. (p.6, l.21-23) This communication service routes the message to a mobile communication device 20 that, for example, can be a WAP cell phone, SMS cell phone or a beeper with display. (p.6, l. 23-p.7, l.2)

Figure 3 shows the user interface 21 of the monitor 17 of the operator console 6 of the MR unit 2. An image processing window with a number of juxtaposed MR exposures is reproduced on the user interface 21, a control region 23 with icons for triggering commands being arranged next to this in a known way for operation. (p.7, l.3-6)

When an expert is to be notified proceeding from the MR operator console 6 because a question or a problem arises during the examination or during the post-processing, then the communication window 18 can be opened on the user interface 21 of the operator console 6 of the MR unit 2 by clicking on the icon 24. (p.7, l.3-6)

An input field 25 for the expert to be called is arranged in the communication window 18, this, for example, being pre-occupied by the name of the attending physician from the electronic patient record (EPR). The patient can be entered into a

further name field 26, whereby the name of the patient is pre-occupied from the patient present at the operator console 6. (p.7, l.11-15) An input field 27 for the procedure, pre-occupied from the current examination, can likewise be edited. The problem and the urgency can be briefly explained in a text field 28, so that the expert can react or reply immediately. (p.7, l.15-17) By pressing the "send" button, the message is transmitted as datafile via the communication server 14 to the transmitter 15 and is then forwarded to the communication device 20 by radio or infrared light. (p.7, l.18-20)

By clicking an audio icon 29, a voice input can ensue with a microphone (not shown), the voice input being communicated to the communication device 20 as audio datafile and being emitted thereat. (p.7, l.21-23)

The call system also can have an information return channel 30 (shown in Figure 2) from the communication device 20 to the workstation 16 via which the communication device 20 can send a received confirmation after reading the message. (p.8, l.1-3)

However, an answer to the question asked of the expert also can be communicated either in text form — as a text datafile entered at the communication device 20 and sent to the workstation 16 — or likewise by voice input with audio datafile. (p.8, l.4-6)

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL:

The following issues are presented in the present Appeal:

Whether claim 1 is indefinite under 35 U.S.C. §112, second paragraph;

Whether the subject matter of claims 1-14 is anticipated under 35 U.S.C. §102(e) by United States Patent No. 6,321,113 (Parker et al.);

Whether the subject matter of claim 15 would have been obvious to a person of ordinary skill in the field of medical system architecture design under the provisions of 35 U.S.C. §103(a) based on the teachings of Parker et al. in view of United States Patent No. 6,629,131 (Choi);

Whether the subject matter of claims 16-19 and 22 would have been obvious to a person of ordinary skill in the field of medical system architecture design under the provisions of 35 U.S.C. §103(a) based on the teachings of Parker et al., further in view of "Official Notice" of various types of communication software and components;

Whether the subject matter of claim 20 would have been obvious to a person of ordinary skill in the field of medical system architecture design under the provisions of 35 U.S.C. §103(a) based on the teachings of Parker et al., further in view of United States Patent No. 6,304,898 (Shiigi); and

Whether the subject matter of claim 21 would have been obvious to a person of ordinary skill in the field of medical system architecture design under the provisions of 35 U.S.C. §103(a) based on the teachings of Parker et al., further in view of United States Patent No. 6,829,478 (Layton et al.).

ARGUMENT:

Rejection of Claim 1 Under §112, Second Paragraph

In the first Final Rejection dated September 15, 2005, the Examiner, for the first time, cited and relied on two patents, for the first time, not as a basis for rejecting the claims, but as a basis for substantiating the Examiner's broad interpretation of the term "medical images" in the claims. (Those patents are no longer relied upon

by the Examiner and the second Final Rejection dated June 26, 2006, from which the present appeal is taken.)

In that first Final Rejection dated September 15, 2005, claim 1 was rejected under §112, second paragraph as being indefinite because of a lack of antecedent basis for the terms "said examination images" and "said medical images" that were both, at the time, used in claim 1.

In response, Appellants filed Amendment "C" Under 37 C.F.R.§ 1.116, on January 17, 2006, wherein claim 1 was amended to consistently use the term medical examination images throughout, to overcome the rejection under §112. With that amendment, Appellants also submitted the documents which are now relied upon herein as Exhibits "A", "B" and "C". to respond to the Examiner's new citation of patents.

In an Advisory Action dated February 1, 2006, the Examiner refused to enter Amendment "C" because, in the opinion of the Examiner, it raised new issues requiring further searching or consideration.

Thereafter, on February 14, 2006, Appellants filed a document entitled Petition for Entry of After Final Amendment for which entry was refused. This Petition was denied in an Advisory Action dated March 9, 2006, but the reason for denial was not because of the submission of the exhibits, but was stated to be because of the amendments to claim 1.

Appellants thereafter prepared a revised response wherein the amendments to claim 1 were deleted, but the exhibits were still submitted. In an Advisory Action dated April 14, 2006, the Examiner refused to enter the revised response, stating that it also raised a new issue by virtue of the exhibits, even though these were being

submitted for responding to arguments made for the first time by the Examiner in the first Final Rejection.

Since Appellants had already decided to file a Notice of Appeal, Appellants believed it was important for the Board of Patent Appeals and Interferences to have these exhibits before deciding the appeal, and therefore it was it was important to have these exhibits officially entered as part of the prosecution file, so they could be relied on in Appellants' Appeal Brief.

Appellants therefore filed a Request for Continued Examination on May 2, 2006 (Exhibit "I"), which specifically requested entry and consideration of the Amendment filed on January 17, 2006, which was the Amendment wherein claim 1 was amended and the exhibits initially submitted.

In the second Final Rejection dated June 6, 2006 (which was the first Action following the filing of the RCE), the Examiner acknowledged that all of the requirements for filing of the RCE had been satisfied, but for reasons unknown to the Appellants, the Examiner treated the RCE as requesting entry of the document which the Examiner called an "Amendment" that was filed on April 4, 2006. As noted above, that document was not an Amendment, and, more importantly, was not the document that was specifically referenced in the RCE as being entered. As noted above, the document entered by the RCE was the aforementioned Amendment filed on January 17, 2006.

Therefore, the Amendment filed January 17, 2006 by virtue of the filing of the RCE, is properly in the prosecution file, and claim 1 as presented in that Amendment overcomes the rejection under §112, second paragraph. Claim 1 presented herein in the Appendix, therefore, includes the changes that were made in this Amendment.

Consistent with the Examiner's error in assuming that the RCE related to the paper that was filed on April 4, 2006, the Examiner stated that paper did not make any amendments to claim 1, and therefore the Examiner repeated the aforementioned rejection under §112.

The Examiner's rejection of claim 1 under §112, second paragraph, therefore, was based on a version of claim 1 that was not the current prosecution version of claim 1, and is therefore erroneous for that reason. As noted above, the current version of claim 1 that is properly in the prosecution file is in full compliance with all provisions of §112, second paragraph.

Rejection of Claims 1-14 Under 35 U.S.C. §102(e) as being Anticipated by Parker et al.

Claim 1 claims a medical system architecture wherein examination images of an examination subject are acquired with an imaging modality, and are supplied to a workstation that is connected to a system for transmitting the examination images to at least one location that is remote from the workstation. The medical system architecture of claim 1 also requires a call system allocated to the workstation for transmitting messages *together with data representing the medical images* to a remote location.

Appellant's position with regard to all rejections based on the Parker et al. reference (Exhibit D) is that there is no disclosure in the Parker et al. reference describing the generation or transmission of images in general, nor any disclosure of the transmission of medical images or examination images (both terms being used in claim 1, as noted above). The Parker et al. reference is exclusively concerned with the generation and transmission of text data, possibly combined with a representation of an electrical signal, such as an ECG. Appellants argued that an

ECG is simply a trace or a curve, representing a single electrical signal, and does not represent a medical examination image, as that term is commonly understood by those of ordinary skill in the field of medical imaging.

Numerous standard texts and dictionaries support the position of the Appellants that the term "medical examination image" is not considered by those of ordinary skill in the field of medical imaging to encompass an ECG.

Attached hereto as Exhibit "A" is an excerpt from the *McGraw-Hill Dictionary of Scientific and Technical Terms*, providing a definition of medical imaging as the production of visual representations of body parts, tissues or organs. This definition clearly does not encompass an ECG, and electrocardiography is not listed as being among the general categories of medical imaging provided in that definition.

Exhibit "B" is an excerpt from a standard medical text (*Foundations of Medical Imaging*), and in the introduction, that provides an overview of all types of medical imaging that will treated in the text, a definition is provided in the third full paragraph at page 4, stating that modern or contemporary medical imaging is a two-part process: (1) the collection of data concerning the interaction of some form of radiation with tissue, and (2) the transformation of these data into an image (or a set of images) using specific mathematical methods and computational tools. Clearly an ECG is simply a measurement of an electrical signal, and does not involve the interaction of radiation with a subject. In this regard, it is no different than a curve representing a measurement of blood pressure, temperature, etc., and thus falls into the category of "sensing" rather than "imaging." An excerpt from another standard text (*Principles of Medical Imaging"*) Is attached hereto as "Exhibit "D". In the

Preface to that textbook, the various categories of medical imaging (imaging modalities) are listed, and clearly ECG is not included.

Appellants respectfully submit that the exhibits hereto are highly representative of the meaning that those of ordinary skill in the field of medical imaging ascribe to the term "medical examination images," and they clearly demonstrate that those of ordinary skill do not ordinarily consider an ECG to fall within that definition.

In the context of the anticipation rejection based on Parker et al., this is not simply a trivial or semantic distinction. The fact that the Parker et al. reference does not provide any *disclosure* whatsoever with regard to acquiring or transmitting medical examination images, as that term is commonly understood by those of ordinary skill in the field of medical imaging, is sufficient to overcome the anticipation rejection of claims 1-14 based on the Parker et al. reference, since the Parker et al. reference does not disclose all of the elements of claim 1 as arranged and operating in that claim. Claims 2-14 add further structure to the novel combination of claim 1, and therefore are not anticipated by Parker et al. for the same reasons.

Rejection of Claim 15 Under 35 U.S.C. §103(a) Based on Parker et al. and Choi.

As to all of the rejections under 35 U.S.C. §103(a) wherein Parker et al. is relied upon as the primary reference, in combination with respective secondary references or "official notice," the distinction between a "medical examination image" and an ECG is relevant because, in order to substantiate a rejection under 35 U.S.C. §103(a) based on a modification of the Parker et al. reference, the Examiner must provide evidentiary support for the position that it would have been obvious to a person of ordinary skill in the field of medical imaging to make use of the teachings

of Parker et al., which are exclusively directed to the generation and transmission of an ECG, for the purpose of generating and transmitting true "medical examination images." In view of the above evidence showing that those of ordinary skill in the field of medical imaging do not consider an ECG to fall into the category of a "medical examination image," Applicants respectfully submit the Examiner cannot simply conclude, without proper evidentiary support, that there is no difference between the two. Appellants respectfully submit the Examiner has not provided the proper evidentiary support required by numerous decisions of the United States Court of Appeals for the Federal Circuit indicating a motivation, inducement or guidance in any of the references of record to apply the teachings of Parker et al., which are exclusively disclosed in that reference in the context of ECG generation and transmission, to the generation and transmission of "medical examination images." In view of the significant differences between an ECG and a true "medical examination image," Appellants respectfully submit that even if a person of ordinary skill in the field of medical imaging had the insight to apply the ECG-based teachings of Parker et al. to the field of medical imaging, this would be an insight supporting patentability, rather than a basis for negating patentability.

The Federal Circuit stated in *In re Lee* 227 F.3d 1338, 61 U.S.P.Q. 2d 1430 (Fed. Cir. 2002):

> "The factual inquiry whether to combine references must be thorough and searching. ...It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions, and cannot be dispensed with."

Similarly, quoting *C.R. Bard, Inc. v. M3 Systems, Inc.* 157 F.3d 1340, 1352, 48 U.S.P.Q. 2d 1225, 1232 (Fed. Cir. 1998), the Federal Circuit in *Brown &*

Williamson Tobacco Court v. Philip Morris, Inc., 229 F.3d 1120, 1124-1125, 56 U.S.P.Q. 2d 1456, 1459 (Fed. Cir. 2000) stated:

> [A] showing of a suggestion, teaching or motivation to combine the prior art references is an 'essential component of an obviousness holding'.

In *In re Dembiczak,* 175 F.3d 994,999, 50 U.S.P.Q. 2d 1614, 1617 (Fed. Cir. 1999) the Federal Circuit stated:

> Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.

Consistently, in *In re Rouffet,* 149 F.3d 1350, 1359, 47 U.S.P.Q. 2d 1453, 1459 (Fed. Cir. 1998), the Federal Circuit stated:

> [E]ven when the level of skill in the art is high, the Board must identify specifically the principle, known to one of ordinary skill in the art, that suggests the claimed combination. In other words, the Board must explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.

In *Winner International Royalty Corp. v. Wang,* 200 F.3d 1340, 1348-1349, 53 U.S.P.Q. 2d 1580, 1586 (Fed. Cir. 2000), the Federal Circuit stated:

> Although a reference need not expressly teach that the disclosure contained therein should be combined with another, ... the showing of combinability, in whatever form, must nevertheless be clear and particular.

Lastly, in *Crown Operations International, Ltd. v. Solutia, Inc.,* 289 F.3d 1367, 1376, 62 U.S.P.Q. 2d 1917 (Fed. Cir. 2002), the Federal Circuit stated:

> There must be a teaching or suggestion within the prior art, within the nature of the problem to be solved, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources, to select particular elements, and to combine them as combined by the inventor.

For these reasons, even if the Examiner's statements regarding the individual teachings of the Choi reference (Exhibit "E") are accurate, Appellants respectfully submit the Examiner has not satisfied the aforementioned rigorous evidentiary standards for the Examiner's interpretation of the term "medical image" in claim 1, nor as to the alleged guidance, based on teachings in the references themselves, for combining the references in the manner proposed by the Examiner.

Claim 15, therefore, would not have been obvious to a person of ordinary skill in the field of medical system architecture design under the provisions of 35 U.S.C. §103(a), based on the teachings of Parker et al. and Choi.

Rejection of Claims 16-19 and 22 Under 35 U.S.C. §103(a) as being Unpatentable over Parker et al. in View of "Official Notice"

With regard to claim 16, the Examiner took Office Notice that the concept and advantages of using Corba technology are well known, and the Examiner took the same position with regard to Official Notice with respect to the use of instant messaging technology in claim 17, Java Enterprise Beans technology in claim 18, the use of Java Applet in a browser with regard to claim 19 and the use of a beeper with regard to claim 22. For brief descriptions of Corba and Java Beans, the Examiner cited Microsoft Computer Dictionary, 5th Ed. (Exhibit "F).

For the same reasons discussed above in connection with the rejection based on Parker et al. and Choi, Appellants respectfully submit that even if the Examiner's conclusions regarding the various items for which Official Notice has been taken are correct, the references still do not provide the rigorous evidentiary support as to teachings that would guide a person of ordinary skill in the medical architecture technology to combine the known information with the subject matter of claim 1.

<u>Rejection of Claim 20 under 35 U.S.C. §103(a) as Unpatentable over Parker et al. in view of Shiigi</u>

The Examiner has relied on the Shiigi reference (Exhibit "G") as teaching a WAP phone, which the Examiner acknowledges is not taught in the Parker et al. reference. Appellants acknowledge that the Shiigi reference provides such a teaching, however, for the same reasons noted above with regard to the other rejections under 35 U.S.C. §103(a), Appellants respectfully submit the Examiner has failed to satisfy the high standard of evidence required to support the position that either of the Parker et al. or Shiigi references provides teachings, motivations, inducements or guidance to a person of ordinary skill in the field of medical system architecture design, so as to justify a conclusion that it would have been obvious to such a person of ordinary skill to modify the Parker et al. reference in accordance with the disclosure of the Shiigi reference. This is particularly true, as with the other rejections under 35 U.S.C. §103(a), in view of the discussion above regarding the term "medical image" in claim 1 and the lack of a teaching thereof in the Parker et al. reference.

<u>Rejection of Claim 21 under 35 U.S.C. §103(a) as Being Unpatentable over Parker et al. in view of Layton et al.</u>

The Examiner relied on the Layton et al. reference (Exhibit "H") as teaching an SMS phone, which the Examiner acknowledged is not disclosed in the Parker et al. reference. Appellants acknowledge that the Layton et al. reference provides such a teaching, but for the reasons noted above with regard to the other rejections under 35 U.S.C. §103(a), Appellants respectfully submit the Examiner has failed to satisfy the high standard of evidence required to support the position that either of the Parker et al. or Layton et al. references provide teachings, motivations, inducements

or guidance to a person of ordinary skill in the field of medical system architecture design, so as to justify a conclusion that it would have been obvious to a person of ordinary skill to modify the Parker et al. reference in accordance with the teachings of the Layton et al. reference. This is particularly true, as with the other rejections under 35 U.S.C. §103(a) in view of the discussion above regarding the term "medical image" in claim 1 and the lack of a teaching thereof in the Parker et al. reference.

CONCLUSION:

For the foregoing reasons, Appellants respectfully submit the Examiner is in error in law and in fact in rejecting claims 1-22 that are of the subject of the present Appeal. Reversal of those rejections is therefore proper, and the same is respectfully requested.

This Appeal Brief is accompanied by a request to credit the previously-paid Appeal Brief filing fee to the present Appeal Brief.

Submitted by,

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CERTIFICATE OF MAILING

I hereby certify this correspondence is being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on January 26, 2007.

Steven H. Noll

STEVEN H. NOLL

CLAIMS APPENDIX

1. A medical system architecture comprising:

an imaging modality for acquiring medical examination images of an examination subject;

a workstation selected from the group of workstations consisting of workstations for acquiring said examination images, workstations for sending said examination image, and workstations for receiving said examination images;

a system connected to said workstation for transmitting said medical examination images to at least one location remote from said workstation; and

a call system allocated to said workstation for transmitting messages together with data representing said medical examination images to a remote location.

2. A medical system architecture as claimed in claim 1 wherein said workstation also processes data associated with said examination images, and further comprising a memory connected to said system which stores said data and said examination images in allocated fashion.

3. A medical system architecture as claimed in claim 1 wherein said call system allows manually modifiable entries of auxiliary information to ensue automatically from object types stored in a data bank.

4. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a mobile communication device.

5. A medical system architecture as claimed in claim 4 wherein said user front end is integrated in an application at said workstation.

6. A medical system architecture as claimed in claim 4 wherein said communication services comprises a communication server and a communication system.

7. A medical system architecture as claimed in claim 1 wherein said call system allows a manually modifiable entry of a message recipient to ensue automatically in said message.

8. A medical system architecture as claimed in claim 1 wherein said call system allows a manually modifiable entry of a current patient, being examined with said modality, to ensue automatically in said message.

9. A medical system architecture as claimed in claim 1 wherein said call system allows a manually modifiable entry of a current procedure being executed by said modality to ensue automatically in said message.

10. A medical system architecture as claimed in claim 1 wherein said call system allows entry of an arbitrary text as specific auxiliary information in said message.

11. A medical system architecture as claimed in claim 1 wherein said call system comprises a mobile communication device with a display.

12. A medical system architecture as claimed in claim 11 wherein said call system includes a voice input unit at said workstation allowing a voice input to be transmitted to said communication device as an audio data file, and wherein said communication device comprises an audio transducer allowing emission of said voice input at said communication device.

13. A medical system architecture as claimed in claim 1 wherein said workstation has a monitor on which said medical examination images are displayed, and wherein said call system is connected to said workstation to cause a communication window to be overlaid on said examination images at said monitor.

14. A medical system architecture as claimed in claim 1 wherein said call system comprises a mobile communication device with a display and an information return channel from said communication device to said workstation allowing information to be transmitted from said communication device to said workstation.

15. A medical system architecture as claimed in claim 14 wherein said communication device transmits a confirmation of receipt of said message to said workstation after said message has been read at said communication device.

16. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a mobile communication device, and wherein said workstation communicates with said communication service via Corba technology.

17. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a mobile communication device, and wherein said workstation communicates with said communication service via Instant Messaging technology.

18. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a mobile communication device, and wherein said workstation communicates with said communication service via Java Enterprise Beans technology.

19. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a mobile communication device, and wherein said user front end comprises a Java applet in a browser.

20. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a WAP cell phone.

21. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a SMS cell phone.

22. A medical system architecture as claimed in claim 1 wherein said call system comprises a user front end, a communication service and a beeper with a display.

RELATED APPEALS AND INTERFERENCES

None.

EVIDENCE APPENDIX

Exhibit A:	McGraw-Hill Dictionary of Scientific and Technical Terms, 5th Ed., Parker (Editor in Chief (1994)) - submitted with January 17, 2006 Amendment that was entered upon the filing of the RCE on May 2, 2006.
Exhibit B:	"Foundations of Medical Imaging," Cho et al. (1993) pages 3-5 - submitted with January 17, 2006 Amendment that was entered upon the filing of the RCE on May 2, 2006.
Exhibit C:	"Principles of Medical Imaging," Shung et al. (1992) pages xiii - xiv - submitted with January 17, 2006 Amendment that was entered upon the filing of the RCE on May 2, 2006.
Exhibit D:	United States Patent No. 6,321,113 (Parker et al.) - cited in the Final Rejection dated June 26, 2006.
Exhibit E:	United States Patent No. 6,629,131 (Choi) - cited in the Final Rejection dated June 26, 2006.
Exhibit F:	Microsoft Computer Dictionary, 5th Ed. - cited in the Final Rejection dated June 26, 2006.
Exhibit G:	United States Patent No. 6,304,898 (Shiigi) - cited in the Final Rejection dated June 26, 2006.
Exhibit H:	United States Patent No. 6,829,478 (Layton et al.) - cited in the Final Rejection dated June 26, 2006.
Exhibit I:	Request for Continued Examination (RCE) Transmittal - filed May 2, 2006.
Exhibit J:	Figs. 1-3 - filed as part of the original application on November 19, 2001.

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Fifth Edition

Sybil P. Parker
Editor in Chief

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On the cover: Photomicrograph of crystals of vitamin B_1.
(Dennis Kunkel, University of Hawaii)

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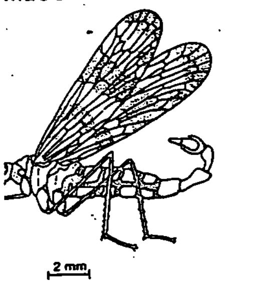
in the fetal intestine, becoming the first fecal discharge of the newborn. { mə'kō·nē·əm }

meconium ileus [MED] Intestinal obstruction in the newborn with cystic fibrosis due to trypsin deficiency. { mə'kō·nē·əm 'il·ē·əs }

MECOPTERA



pion fly *(Panorpa)*.

Mecoptera [INV ZOO] The scorpion flies, a small order of insects; adults are distinguished by the peculiar prolongation of the head into a beak, which bears chewing mouthparts. { me'käp·tə·rə }

mecystasis [PHYSIO] Increase in muscle length with maintenance of the original degree of tension. { me'sis·tə·səs }

media [HISTOL] The middle, muscular layer in the wall of a vein, artery, or lymph vessel. { 'mē·dē·ə }

media conversion [COMPUT SCI] The transfer of data from one storage type (such as punched cards) to another storage type (such as magnetic tape). { 'mē·dē·ə kən,vər·zhən }

media conversion buffer [COMPUT SCI] Large storage area, such as a drum, on which data may be stored at low speed during nonexecution time, to be later transferred at high speed into core memory during execution time. { 'mē·dē·ə kən,vər·zhən ,bəf·ər }

mediad [ANAT] Toward the median line or plane of the body or of a part of the body. { 'mē·dē,ad }

medial [ANAT] **1.** Being internal as opposed to external (lateral). **2.** Toward the midline of the body. [SCI TECH] Located in the middle. { 'mē·dē·əl }

medial arteriosclerosis [MED] Calcification of the tunica media of small and medium-sized muscular arteries. Also known as medial calcinosis; Mönckeberg's arteriosclerosis. { 'mē·dē·əl ,är·tir·ē·ō·sklə'rō·səs }

medial calcinosis *See* medial arteriosclerosis. { 'mē·dē·əl ,kal·sə'nō·səs }

medial lemniscus [ANAT] A lemniscus arising in the nucleus gracilis and nucleus cuneatus of the brain, crossing immediately as internal arcuate fibers, and terminating in the posterolateral ventral nucleus of the thalamus. { 'mē·dē·əl lem'nis·kəs }

medial moraine [GEOL] **1.** An elongate moraine carried in or upon the middle of a glacier and parallel to its sides. **2.** A moraine formed by glacial abrasion of a rocky protuberance near the middle of a glacier. { 'mē·dē·əl mə'rān }

medial necrosis [MED] Death of cells in the tunica media of arteries. Also known as medionecrosis. { 'mē·dē·əl ne'krō·səs }

media migration [CHEM ENG] Carryover of fibers or other filter material by liquid effluent from a filter unit. { 'mē·dē·ə mī'grā·shən }

median [MATH] **1.** Any line in a triangle which joins a vertex to the midpoint of the opposite side. **2.** The line that joins the midpoints of the nonparallel sides of a trapezoid. Also known as midline. [SCI TECH] Located in the middle. [STAT] An average of a series of quantities or values; specifically, the quantity or value of that item which is so positioned in the series, when arranged in order of numerical quantity or value, that there are an equal number of items of greater magnitude and lesser magnitude. { 'mē·dē·ən }

median effective dose *See* effective dose 50. { 'mē·dē·ən i'fek·tiv 'dōs }

median infective dose *See* infective dose 50. { 'mē·dē·ən in'fek·tiv 'dōs }

median lethal dose *See* lethal dose 50. { 'mē·dē·ən 'lēth·əl 'dōs }

median lethal time [MICROBIO] The period of time required for 50% of a large group of organisms to die following a specific dose of an injurious agent, such as a drug or radiation. { 'mē·dē·ən 'lēth·əl ,tīm }

median mass [GEOL] A less disturbed structural block in the middle of an orogenic belt, bordered on both sides by orogenic structure, thrust away from it. Also known as betwixt mountains; Zwischengebirge. { 'mē·dē·ən 'mas }

median maxillary cyst [MED] Cystic dilation of embryonal inclusions in the incisive fossa or between the roots of the central incisors. Also known as nasopalatine cyst. { 'mē·dē·ən 'mak·sə,ler·ē ,sist }

median nasal process [EMBRYO] The region below the frontonasal sulcus between the olfactory sacs; forms the bridge and mobile septum of the nose and various parts of the upper jaw and lip. { 'mē·dē·ən 'nāz·əl ,prä·səs }

median nerve test [MED] A test for loss of function of the median nerve by having the patient abduct the thumb at right angles to the palm with fingertips in contact and forming a pyramid. { 'mē·dē·ən 'nərv ,test }

median particle diameter [GEOL] The middlemost particle diameter of a rock or sediment, larger than 50% of the diameters in the distribution and smaller than the other 50%. { 'mē·dē·ən 'pärd·ə·kəl dī,am·əd·ər }

median point [MATH] The point at which all three medians of a triangle intersect. { 'med·ē·ən ,pȯint }

median strip [CIV ENG] A paved or planted section dividing a highway into lanes according to direction of travel. { 'mē·dē·ən 'strip }

mediastinitis [MED] Inflammation of the mediastinum. { ,mē·dē,as·tə'nīd·əs }

mediastinum [ANAT] **1.** A partition separating adjacent parts. **2.** The space in the middle of the chest between the two pleurae. { ,mē·dē·ə'stī·nəm }

medical bacteriology [MED] A branch of medical microbiology that deals with the study of bacteria which affect human health, especially those which produce disease. { 'med·ə·kəl bak,tir·ē'äl·ə·jē }

medical chemical engineering [CHEM ENG] The application of chemical engineering to medicine, frequently involving mass transport and separation processes, especially at the molecular level. { 'med·ə·kəl 'kem·ə·kəl ,en·jə'nir·iŋ }

medical climatology [MED] The study of the relation between climate and disease. { 'med·ə·kəl ,klī·mə'täl·ə·jē }

medical electronics [ELECTR] A branch of electronics in which electronic instruments and equipment are used for such medical applications as diagnosis, therapy, research, anesthesia control, cardiac control, and surgery. { 'med·ə·kəl i,lek'trän·iks }

medical entomology [MED] The study of insects that are vectors for diseases and parasitic infestations in humans and domestic animals. { 'med·ə·kəl ,en·tə'mäl·ə·jē }

medical ethics [MED] Principles and moral values of proper medical conduct. { 'med·ə·kəl 'eth·iks }

medical examiner [MED] A professionally qualified physician duly authorized and charged by a governmental unit to determine facts concerning causes of death, particularly deaths not occurring under natural circumstances, and to testify thereto in courts of law. { 'med·ə·kəl ig'zam·ə·nər }

medical frequency bands [COMMUN] A collection of radio frequency bands allocated to medical equipment in the United States. { 'med·ə·kəl 'frē·kwən·sē ,banz }

medical genetics [GEN] A field of human genetics concerned with the relationship between heredity and disease. { 'med·ə·kəl jə'ned·iks }

medical geography [MED] The study of the relation between geographic factors and disease. { 'med·ə·kəl jē'äg·rə·fē }

medical history [MED] An account of a patient's past and present state of health obtained from the patient or relatives. { 'med·ə·kəl 'his·trē }

medical imaging [MED] The production of visual representations of body parts, tissues, or organs, for use in clinical diagnosis; encompasses x-ray methods, magnetic resonance imaging, single-photon-emission and positron-emission tomography, and ultrasound. { 'med·ə·kəl 'im·ij·iŋ }

medical microbiology [MED] The study of microorganisms which affect human health. { 'med·ə·kəl ¦mī·krō·bī'äl·ə·jē }

medical mycology [MED] A branch of medical microbiology that deals with fungi that are pathogenic to humans. { 'med·ə·kəl mī'käl·ə·jē }

medical parasitology [MED] A branch of medical microbiology which deals with the relationship between humans and those animals which live in or on them. { 'med·ə·kəl ,par·ə·si'täl·ə·jē }

medical protozoology [MED] A branch of medical microbiology that deals with the study of Protozoa which are parasites of humans. { 'med·ə·kəl ,prō·dō·zō'äl·ə·jē }

medical radiography [MED] The use of x-rays to produce photographic images for visualizing internal anatomy as an aid in diagnosis. { 'med·ə·kəl ,rād·ē·'äg·rə·fē }

medication [MED] **1.** A medicinal substance. **2.** Treatment by or administration of a medicine. { ,med·ə'kā·shən }

medicinal [MED] Of, pertaining to, or having the nature of medicine. { mə'dis·ən·əl }

medicinal oil [MATER] A highly refined, colorless, tasteless and odorless petroleum oil used medicinally as an internal lu-

FOUNDATIONS OF MEDICAL IMAGING

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1

INTRODUCTION

The study of medical imaging is concerned with the interaction of all forms of radiation with tissue and the development of appropriate technology to extract clinically useful information from observations of this interaction. Such information is usually displayed in an image format. Medical images can be as simple as a projection or shadow image—as first produced by Röntgen nearly 100 years ago and utilized today as a simple chest X-ray—or as complicated as a computer reconstructed image—as produced by computerized tomography (CT) using X-rays or by magnetic resonance imaging (MRI) using intense magnetic fields.

Although, strictly speaking, medical imaging began in 1895 with Röntgen's discoveries of X-rays and of the ability of X-rays to visualize bones and other structures within the living body [1], contemporary medical imaging began in the 1970s with the advent of computerized tomography [2, 3]. Early, or what we call *classical*, medical imaging utilizes images that are a direct manifestation of the interaction of some form of radiation with tissue. Three examples will illustrate what we mean by classical imaging. First is the conventional X-ray procedure in which a beam of X-rays is directed through the patient onto a film. The developed film provides a shadow image of the patient which is a direct representation of the passage of X-rays through the body. Although such images are not quantitative, they do provide some measure of the attenuation of X-rays in tissue. Thus a section of soft tissue will appear darker than an equally thick section of bone, which attenuates more of the X-rays. It should be noted that even with current technological developments

conventional X-ray imaging still represents the major imaging procedure at most medical facilities.

As a second example of classical imaging, consider a conventional nuclear medicine procedure. Here a radioactive material is injected into the patient and its course followed by a detector which is moved over the patient in a specified manner. Although the image recorded by the detector generally has poor spatial resolution, its real advantage is that it provides a measure of physiological function from the time course of the radioisotope uptake. Clearly the conventional nuclear medicine image is a direct measure of the location and concentration of the radioactive isotope used.

As a final example of classical imaging, consider conventional medical ultrasound. Here, a pulse of ultrasonic energy is propagated into the patient and the backscattered echo signal is recorded by the same transducer. By angulating or moving the transducer (or by using a transducer array) positionally sequential echo signals are recorded, and a cross-sectional image of the subject is displayed directly on a video monitor. Ultrasound images are really a mapping of echo intensities and are a direct result of the interaction of the ultrasound pulse with tissue.

In this text we will define modern or contemporary medical imaging operationally as a two-part process: (1) the collection of data concerning the interaction of some form of radiation with tissue, and (2) the transformation of these data into an image (or a set of images) using specific mathematical methods and computational tools. Note that our definitions for both classical and modern imaging are consistent with our general definition of medical imaging, given in the first paragraph of this chapter. Note also that modern imaging can be represented as a generalization of classical imaging and that classical imaging is simply a special case of modern imaging in which the image forms directly from the interaction process. Whereas classical imaging is direct and intuitive, modern imaging is indirect and, in many cases, counter intuitive. Since modern images are formed by processing, reformulating, or reconstructing an image from the tissue/radiation interaction data base, the process is often referred to as "reconstruction" and the image as a "reconstructed image."

The first device capable of producing true reconstructed images was developed by G. N. Hounsfield [2] in 1972 at EMI in England. Hounsfield's X-ray computerized tomograph device was based in part on mathematical methods developed by A. M. Cormack [4] a decade earlier. For their efforts Hounsfield and Cormack were awarded the Nobel Prize in medicine in 1979. Put quite simply, CT imaging is based on the mathematical formalism that states that if an object is viewed from a number of different angles, then a cross-sectional image of it can be computed (or "reconstructed"). Thus X-ray CT yields an image that is essentially a mapping of X-ray attenuation or tissue density.

The introduction of X-ray CT in 1972 represents the real beginning of modern imaging and has altered forever our concept of imaging as merely

Table 1-1 3-D image reconstruction algorithms

2-D and 3-D Projection Reconstruction	2-D Projection Reconstruction	Parallel-Beam Mode
		Fan-Beam Mode
	3-D Projection Reconstruction	Parallel-Beam Mode
		Cone-Beam Mode
Iterative Method	Algebraic Reconstruction Technique (ART)	
	Maximum Likelihood Reconstruction (MLR) or Expectation Maximization (EM) Reconstruction	
Fourier Reconstruction	Direct Fourier Reconstruction (DFR)	
	Direct Fourier Imaging (DFI) in NMR	

taking a picture. It has also led to the development of 3-D imaging and is making quantitative imaging a reality. The application of reconstructive tomography to conventional nuclear medicine imaging has led to the development of two new imaging modalities: single photon emission computed tomography (SPECT) and positron emission tomography (PET). Similar applications to the laboratory technique of nuclear magnetic resonance (NMR) has led to magnetic resonance imaging (MRI). The CT concept is currently being extended to 3-D magnetoencephalography, electrical impedance tomography, and photon migration tomography, to name a few. Inherent to the development of these new imaging modalities has been the development of new reconstruction techniques, which are detailed in Table 1-1.

In this chapter we seek to provide a brief historical perspective for the various medical imaging modalities that are currently important. The various techniques are shown in Figs. 1-1 and 1-2 where they are characterized by the interrogation wavelengths. A parallel sequence will be followed in the succeeding chapters which provide more detailed discussions of the various imaging modalities. Although the various imaging techniques will, of necessity, be treated separately, our goal is to provide a unified approach to the field of medical imaging.

1-1 THE BEGINNING WITH X-RAYS

The history of medical imaging really began on November 8, 1895, when Wilhelm Konrad Röntgen reported the discovery of what he called "a new

Principles of Medical Imaging

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Cover photograph courtesy of Michael B. Smith. A computer model of the human head showing the naturally occuring magnetic field gradients found in all normal humans when exposed to a homogeneous, static magnetic field of 1 tesla. Each contour line describes a field change of 0.3 parts per million. The differences in the magnetic field are due to the magnetic susceptibility of the air–tissue interface associated with the sinus cavities in the head.

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Preface

The field of medical imaging is growing at a rapid pace. Since the early 1960s, three new imaging modalities, namely, radionuclide imaging, ultrasound, and magnetic resonance imaging, have appeared and matured. Along with X-ray they are among the most important clinical diagnostic tools in medicine today. Radionuclide imaging, although its resolution cannot match that of other modalities, uses radioactive isotopes attached to biochemically active substances to yield unique information about the biochemical or physiological function of the organ which is unattainable otherwise. Ultrasound scanners use high frequency sound waves to interrogate the interior of the body. They are capable of depicting anatomical details with excellent resolution. Ultrasound is particulary suited to situations where exposure to ionizing radiation is undesirable, such as in obstetrical and neonatal scanning, and to imaging structures in motion, such as heart valves. Magnetic resonance imaging, however, has been envisioned to be the most exciting of them all by far because it also uses a form of nonionizing radiation, can achieve superior resolution, and is capable of yielding physiological information. In this period, significant progress has also been achieved in conventional X-ray radiography. Improved design or introduction of better materials in image intensifiers, intensifying and fluoroscopic screens, and photographic films has enhanced the resolution to a significant degree without adding higher patient radiation exposure levels. It is therefore plausible to understand why conventional radiography is still routinely used clinically for the diagnosis of many diseases and is the gold standard to which newer imaging modalities are compared.

Unquestionably, the digital revolution is the primary reason that has caused the medical imaging field to experience the explosive growth that we are seeing today. Computer and digital technology along with advances in electronics have made data acquisition fast and mass data storage possible. These are the most essential ingredients for the practical realization of tomographical reconstruction principles. X-ray computed tomography (CT), digital radiography, real-time ultrasonic scanners, single-photon emission computed tomography (SPECT), positron emission tomography (PET), and magnetic resonance imaging (MRI), which came about after the early 1970s, are just a few well-known products of the digital revolution in medical imaging.

While the development of these new imaging approaches may have contributed greatly to the improvement of health care, it has also contributed to the rising cost of health care. A chest X-ray costs only \$20–30 per procedure whereas a magnetic resonance scan may cost up to \$1000, let alone the expenses associated with acquiring and installing such a scanner. The cost-to-benefit ratio for

these expensive procedures in certain cases is sometimes not as clear as in others. Therefore it is not unusual that the clinical efficacy and contribution of these modalities to patient care are being scrutinized and debated constantly by the medical community as well as the public.

This book is intended to be a university textbook for a senior or first-year graduate level course in medical imaging offered in a biomedical engineering, electrical engineering, medical physics, or radiological sciences department. Much of the material is calculus based. However, an attempt has been made to minimize mathematical derivation and to place more emphasis on physical concepts. A major part of this book was derived from notes used by the authors to teach a graduate course in medical imaging at the Bioengineering Program of Pennsylvania State University since the late 1970s. This book covers all four major medical imaging modalities, namely, X-ray including CT and digital radiography, ultrasound, radionuclide imaging including SPECT and PET, and magnetic resonance imaging. It is divided into four chapters in which a similar format is used. In each chapter fundamental physics involved in a modality is given first, followed by a discussion on instrumentation. Then various diagnostic procedures are described. Finally, recent developments and biological effects of each modality are discussed. At the end of each chapter a list of relevant references, further reading materials, and a set of problems are given. The purpose of this textbook is to give students with an adequate background in mathematics and physics an introduction to the field of diagnostic imaging; the materials discussed should be more than sufficient for one semester. However, the book may also be used as the text for a two-semester course in medical imaging when supplemented by additional materials or by inclusion of more mathematic detail.

Although this book has been written as a college textbook, radiologists with some technical background and practicing engineers or physicists working in imaging industries should also find it a valuable reference in the medical imaging field. As a final note, it should be pointed out that there are other imaging methods that have been used in medicine [e.g., thermography, magnetic imaging, and microwave imaging (Hendee, 1991)]. They are not included in this book primarily due to their limited utility at present. Readers who are interested in these modalities may refer to several books listed in the following reference section.

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CORBA *n.* Acronym for Common Object Request Broker Architecture. A specification developed by the Object Management Group in 1992 in which pieces of programs (objects) communicate with other objects in other programs, even if the two programs are written in different programming languages and are running on different platforms. A program makes its request for objects through an *object request broker*, or *ORB*, and thus does not need to know the structure of the program from which the object comes. CORBA is designed to work in object-oriented environments. *See also* IIOP, object (definition 2), Object Management Group, object-oriented.

core *n.* One of the types of memory built into computers before random access memory (RAM) was available or affordable. Some people still use the term to refer to the main memory of any computer system, as in the phrase *core dump*—a listing of the raw contents of main memory at the moment of a system crash. *Compare* RAM.

core class *n.* In the Java programming language, a public class or interface that is a standard member of the language. Core classes, at minimum, are available on all operating systems where the Java platform runs. A program written entirely in the Java programming language relies only on core classes. *See also* class (definition 1), object, object-oriented programming.

core program *n.* A program or program segment that is resident in random access memory (RAM).

coresident *adj.* Of or pertaining to a condition in which two or more programs are loaded in memory at the same time.

corona wire *n.* In laser printers, a wire though which high voltage is passed to ionize the air and transfer a uniform electrostatic charge to the photosensitive medium in preparation for the laser.

coroutine *n.* A routine that is in memory at the same time as, and frequently executed concurrently with, another.

corrective maintenance *n.* The process of diagnosing and correcting computer problems after they occur. *Compare* preventive maintenance.

correspondence quality *n. See* print quality.

corruption *n.* A process wherein data in memory or on disk is unintentionally changed, with its meaning thereby altered or obliterated.

cost-benefit analysis *n.* The comparison of benefits to costs for a particular item or action. Cost-benefit analysis is often used in MIS or IS departments to determine such things as whether purchasing a new computer system is a good investment or whether hiring more staff is necessary. *See also* IS, MIS.

coulomb *n.* A unit of electrical charge equivalent to roughly 6.26×10^{18} electrons, with a negative charge being an excess of electrons and a positive charge being a deficiency of electrons.

counter *n.* **1.** In programming, a variable used to keep count of something. **2.** In electronics, a circuit that counts a specified number of pulses before generating an output. **3.** A device that keeps track of the number of visitors to a World Wide Web site.

counting loop *n.* In a program, a group of statements that are repeated, thereby incrementing a variable used as a counter (for example, a program might repeat a counting loop that adds 1 to its counter until the counter equals 10). *See also* loop[1] (definition 1).

country code *n. See* major geographic domain.

country-specific *adj.* Of, pertaining to, or characteristic of hardware or software that uses characters or conventions unique to a particular country or group of countries. *Country-specific* does not necessarily refer to spoken languages, although it does allow for special characters (such as accent marks) that are language-specific. Generally, the features considered country-specific include keyboard layout (including special-character keys), time and date conventions, financial and monetary symbols, decimal notation (decimal point or comma), and alphabetic sorting order. Such features are handled either by a computer's operating system (for example, by the Keyboard and Country commands in MS-DOS) or by application programs that offer options for tailoring documents to a particular set of national or international conventions.

courseware *n.* Software dedicated to education or training.

courtesy copy *n. See* cc.

CPA *n. See* Computer Press Association.

CPCP *n. See* HTCPCP.

cpi *n. See* characters per inch.

CP/M *n.* Acronym for Control Program/Monitor. A line of operating systems from Digital Research, Inc. (DRI),

insider attack *n.* An attack on a network or system carried out by an individual associated with the hacked system. Insider attacks are typically the work of current or former employees of a company or organization who have knowledge of passwords and network vulnerabilities. *Compare* intruder attack.

Ins key *n. See* Insert key.

install *vb.* To set in place and prepare for operation. Operating systems and application programs commonly include a disk-based installation, or setup, program that does most of the work of preparing the program to work with the computer, printer, and other devices. Often such a program can check for devices attached to the system, request the user to choose from sets of options, create a place for the program on the hard disk, and modify system startup files as necessary.

installable device driver *n.* A device driver that can be embedded within an operating system, usually in order to override an existing, less-functional service.

Installable File System Manager *n.* In Windows 9x and Windows 2000, the part of the file system architecture responsible for arbitrating access to the different file system components. *Acronym:* IFS.

installation program *n.* A program whose function is to install another program, either on a storage medium or in memory. An installation program, also called a setup program, might be used to guide a user through the often complex process of setting up an application for a particular combination of machine, printer, and monitor.

Installer *n.* A program, provided with the Apple Macintosh operating system, that allows the user to install system upgrades and make bootable (system) disks.

instance *n.* An object, in object-oriented programming, in relation to the class to which it belongs. For example, an object *myList* that belongs to a class *List* is an instance of the class *List*. *See also* class, instance variable, instantiate, object (definition 2).

instance variable *n.* A variable associated with an instance of a class (an object). If a class defines a certain variable, each instance of the class has its own copy of that variable. *See also* class, instance, object (definition 2), object-oriented programming.

instantiate *vb.* To create an instance of a class. *See also* class, instance, object (definition 2).

instant messaging *n.* A service that alerts users when friends or colleagues are on line and allows them to communicate with each other in real time through private online chat areas. With instant messaging, a user creates a list of other users with whom he or she wishes to communicate; when a user from his or her list is on line, the service alerts the user and enables immediate contact with the other user. While instant messaging has primarily been a proprietary service offered by Internet service providers such as AOL and MSN, businesses are starting to employ instant messaging to increase employee efficiency and make expertise more readily available to employees.

Institute of Electrical and Electronics Engineers *n. See* IEEE.

instruction *n.* An action statement in any computer language, most often in machine or assembly language. Most programs consist of two types of statements: declarations and instructions. *See also* declaration, statement.

instruction code *n. See* operation code.

instruction counter *n. See* instruction register.

instruction cycle *n.* The cycle in which a processor retrieves an instruction from memory, decodes it, and carries it out. The time required for an instruction cycle is the sum of the instruction (fetch) time and the execution (translate and execute) time and is measured by the number of clock ticks (pulses of a processor's internal timer) consumed.

instruction mix *n.* The assortment of types of instructions contained in a program, such as assignment instructions, mathematical instructions (floating-point or integer), control instructions, and indexing instructions. Knowledge of instruction mixes is important to designers of CPUs because it tells them which instructions should be shortened to yield the greatest speed, and to designers of benchmarks because it enables them to make the benchmarks relevant to real tasks.

instruction pointer *n. See* program counter.

instruction register *n.* A register in a central processing unit that holds the address of the next instruction to be executed.

instruction set *n.* The set of machine instructions that a processor recognizes and can execute. *See also* assembler, microcode.

Web applications, since users access the Web from many types of computers. Java is used in programming small applications, or applets, for the World Wide Web, as well as in creating distributed network applications. *See also* bytecode, Java applet, Jini, object-oriented programming.

Java applet *n.* A Java class that is loaded and run by an already-running Java application such as a Web browser or an applet viewer. Java applets can be downloaded and run by any Web browser capable of interpreting Java, such as Internet Explorer, Netscape Navigator, and HotJava. Java applets are frequently used to add multimedia effects and interactivity to Web pages, such as background music, real-time video displays, animations, calculators, and interactive games. Applets can be activated automatically when a user views a page, or they may require some action on the part of the user, such as clicking on an icon in the Web page. *See also* applet, Java.

JavaBean *n.* A Java component architecture defined in the JavaBeans specification developed by Sun Microsystems. A JavaBean, or Bean, is a reusable application component—an independent code segment—that can be combined with other JavaBean components to create a Java applet or application. The JavaBean concept emphasizes the platform-independence of the Java language, in which ideally a program, once written, can run on any computing platform. JavaBeans are similar to Microsoft's ActiveX controls. ActiveX controls, however, can be developed in different programming languages but executed only on a Windows platform. JavaBeans can be developed only in the Java programming language but ideally can run on any platform. *See also* ActiveX, Java.

Java Card *n.* An application programming interface (API) from Sun Microsystems, Inc., that allows Java applets and programs to run on smart cards and other devices with limited memory. Java Card uses a Java Card Virtual Machine designed for severely memory-constrained devices. *See also* applets, Java Card Virtual Machine, smart card (definition 2).

Java Card Virtual Machine *n.* An ultra-small-footprint, highly optimized foundation of a runtime environment within the Java 2 Platform Micro Edition. Derived from the Java Virtual Machine (JVM), it is targeted at smart cards and other severely memory-constrained devices. The Java Card Virtual Machine can run in devices with memory as small as 24 KB of ROM, 16 KB of EEPROM, and 512 bytes of RAM. *See also* EEPROM, Java Card, RAM, ROM.

Java chip *n.* An implementation on a single integrated circuit of the virtual machine specified for execution of the Java programming language. Such chips, which are being developed by Sun Microsystems, Inc., could be used in very small devices and as controllers for appliances. *See also* integrated circuit, Java, virtual machine.

Java-compliant browser *n.* A Web browser with support for the Java programming language built into it. Most current Web browsers are Java-compliant. *See also* Java, Web browser.

Java Developer's Kit *n.* A set of software tools developed by Sun Microsystems, Inc., for writing Java applets or applications. The kit, which is distributed free, includes a Java compiler, interpreter, debugger, viewer for applets, and documentation. *Acronym:* JDK. *See also* applet, Java, Java applet.

Java Foundation Classes *n.* A Java-based set of class libraries developed by Sun Microsystems, Inc. Encompassing fundamentals of the Internet Foundation Classes created by Netscape Communications Corp., the Java Foundation Classes extend the Java Abstract Window Toolkit (AWT) by providing graphical user interface components for use in developing commercial and Internet-related Java applications. *See also* Abstract Window Toolkit, Application Foundation Classes, Internet Foundation Classes, Java, JavaBean, Microsoft Foundation Classes.

Java HotSpot *n.* A Java performance engine introduced by Sun Microsystems, Inc., in 1999 that is designed to run Java applications faster than just-in-time (JIT) compilers. The core of Java HotSpot, and the feature for which it is named, is its ability to perform adaptive optimization—the identification and optimization of "hot spots," or sections of performance-critical code. Improved garbage collection (freeing of memory occupied by objects no longer in use) and better multithreading are additional features designed to contribute to increased performance. *See also* Java.

Java IDL *n.* Short for **Java Interface Definition Language.** A Java technology that provides CORBA interoperability and connectivity capabilities for the Java platform. These capabilities enable Java applications to invoke operations on remote network services using the Object Management Group Interface Definition Language and Internet Inter-ORB Protocol. *See also* CORBA, IDL, J2EE, RMI-IIOP.

JavaMail *n.* An API in the Sun Microsystems, Inc., Java platform for sending and receiving mail. A set of abstract APIs that model a mail system, JavaMail provides a platform-independent and protocol-independent

page layout *n.* In desktop publishing, the process of arranging text and graphics on the pages of a document. Page-layout programs excel in text placement and management of special effects applied to text. Although page-layout programs are generally slower than word-processing programs, they can perform such advanced tasks as flowing text into complex multicolumn page designs, printing documents in signatures, managing color separations, and supporting sophisticated kerning and hyphenation.

page makeup *n.* The assembling of graphics and text on a page in preparation for printing.

page mode RAM *n.* A specially designed dynamic RAM that supports access to sequential memory locations with a reduced cycle time. This is especially attractive in video RAM, in which each location is accessed in ascending order to create the screen image. Page mode RAM can also improve the execution speed of code because code tends to execute sequentially through memory. *See also* cycle time, dynamic RAM.

page orientation *n. See* landscape mode, portrait mode.

page printer *n.* Any printer, such as a laser printer, that prints an entire page at once. Because page printers must store the entire page in memory before printing, they require relatively large amounts of memory. *Compare* line printer.

pager *n.* Pocket-sized wireless electronic device that uses radio signals to record incoming phone numbers or short text messages. Some pagers allow users to send messages as well. *Also called:* beeper.

page reader *n. See* document reader.

page setup *n.* A set of choices that affect how a file is printed on the page. Page setup might reflect the size of paper going into the printer, the page margins, the specific pages in the document to be printed, whether the image is to be reduced or enlarged when printed, and whether another file is to be printed immediately after the first file is printed.

pages per minute *n. See* PPM.

Page Up key *n.* A standard key (often labeled "PgUp") on most computer keyboards whose specific meaning is different in different programs. In many cases, it moves the cursor up to the top of the previous page or a specific number of lines.

pagination *n.* **1.** The process of dividing a document into pages for printing. **2.** The process of adding page numbers, as in a running head.

paging *n.* A technique for implementing virtual memory. The virtual address space is divided into a number of fixed-size blocks called pages, each of which can be mapped onto any of the physical addresses available on the system. Special memory management hardware (MMU or PMMU) performs the address translation from virtual addresses to physical addresses. *See also* memory management unit, paged memory management unit, virtual memory.

paging file *n.* A hidden file on the hard disk that operating systems (such as Windows, Mac OS X, and UNIX) use to hold parts of programs and data files that do not fit in memory. The paging file and physical memory, or RAM, make up virtual memory. Data is moved from the paging file to memory as needed and moved from memory to the paging file to make room for new data in memory. *Also called:* swap file. *See also* virtual memory.

paint¹ *n.* A color and pattern used with graphics programs to fill areas of a drawing, applied with tools such as a paintbrush or a spraycan.

paint² *vb.* To fill a portion of a drawing with paint (color or a pattern).

paintbrush *n.* An artist's tool in a paint program or another graphics application for applying a streak of solid color to an image. The user can usually select the width of the streak. *See also* paint program. *Compare* spraycan.

paint program *n.* An application program that creates graphics as bit maps. A paint program, because it treats a drawing as a group of dots, is particularly appropriate for freehand drawing. Such a program commonly provides tools for images requiring lines, curves, and geometric shapes but does not treat any shape as an entity that can be moved or modified as a discrete object without losing its identity. *Compare* drawing program.

palette *n.* **1.** In paint programs, a collection of drawing tools, such as patterns, colors, brush shapes, and different line widths, from which the user can choose. **2.** A subset of the color look-up table that establishes the colors that can be displayed on the screen at a particular time. The number of colors in a palette is determined by the number of bits used to represent a pixel. *See also* color bits, color look-up table, pixel.

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Subsection (b) of 35 U.S.C.§ 132, effective on May29, 2000, provides for continued examination of a utility or plant application filed on or after June 8, 1995. See the American Inventors Protection Act of 1999 (AIPA).

Application Number	09/992,974
Filing Date	November 19, 2001
First Named Inventor	Thomas Birkhoelzer etal
Group Art Unit	2152
Examiner Name	Ramsey Refai
Attorney Docket Number	P01,0440-01

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.
NOTE: *37 C.F.R. § 1.114 is effective on May 29, 2000. If the above-identified application was filed prior to May 29, 2000, applicant may wish to consider filing a continued prosecution application (CPA) under 37 C.F.R. § 1.53 (d) (PTO/SB/29) instead of a RCE to be eligible for the patent term adjustment provisions of the AIPA.* See *Changes to Application Examination and Provisional Application Practice*, Final Rule, 65 *Fed. Reg.* 50092 *(Aug. 16, 2000);* Interim Rule, 65 *Fed. Reg.* 14865 (Mar. 20, 2000), 1233 *Off. Gaz. Pat. Office* 47 (Apr. 11, 2000), which established RCE practice.

1. Submission required under 37 C.F.R. § 1.114
   - a. ☒ Previously submitted
     - i. ☒ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on January 17, 2006
       (Any unentered amendment(s) referred to above will be entered).
     - ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ______
     - iii. ☐ Other ______
   - b. ☐ Enclosed
     - i. ☐ Amendment/Reply
     - ii. ☐ Affidavit(s)/Declaration(s)
     - iii. ☐ Information Disclosure Statement (IDS)
     - iv. ☐ Other ______
2. Miscellaneous
   - a. ☐ Suspension of Action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)
   - b. ☒ Other Withdrawal of Appeal
3. Fees The RCE fee under 37 C.F.R.§1.17(e) is required by under 37 C.F.R. § 1.114 when the RCE is filed.
   - a. ☐ The director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 501519. A duplicate copy of this page is enclosed.
     - i. ☐ RCE fee required under 37 C.F.R. § 1.17(e)
     - ii. ☐ Extension of time fee (37 C.F. R. §§ 1.136 and 1.17)
     - iii. ☐ Other ______
   - b. ☒ Check in the amount of $790.00 (RCE Filing fee) enclosed
   - c. ☐ Payment by credit card (Form PTO 2038 enclosed)

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print/Type)	STEVEN H. NOLL	Registration No. Attorney/Agent)	28,982
Signature	Steven H. Noll	Date	April 25, 2006

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner For Patents, MAIL STOP RCE, P.O. BOX 1450 Alexandria, VA 22313-1450, or facsimile transmitted to the U.S. Patent and Trademark Office on:

Name (Print/Type)	STEVEN H. NOLL		
Signature	Steven H. Noll	Date	April 25, 2006

ALL-STATE LEGAL® EXHIBIT I

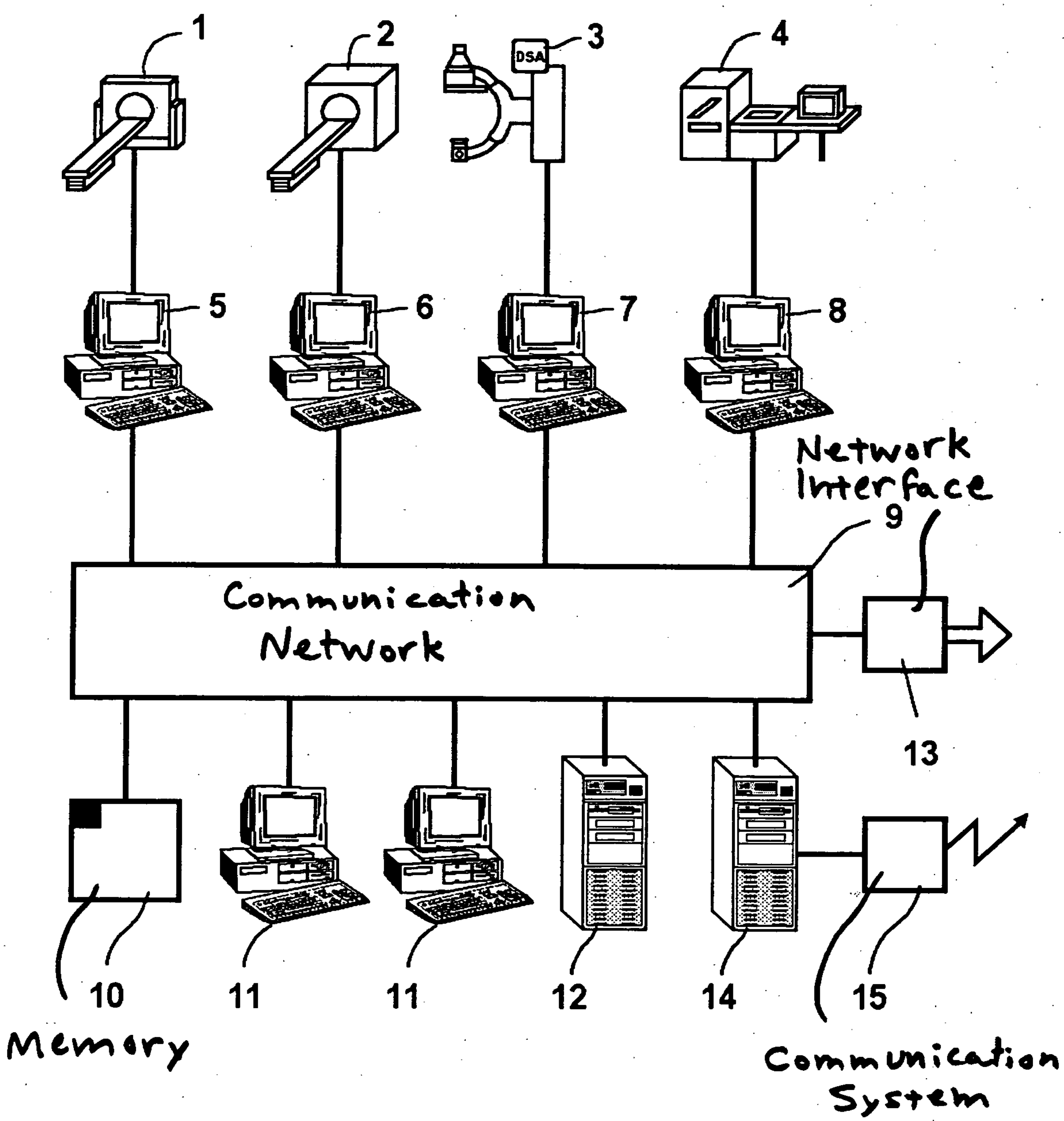
1
2
3
DSA
4
5
6
7
8
Network Interface
9
Communication Network
13
10
11
11
12
14
15
Memory
Communication System

FIG 1

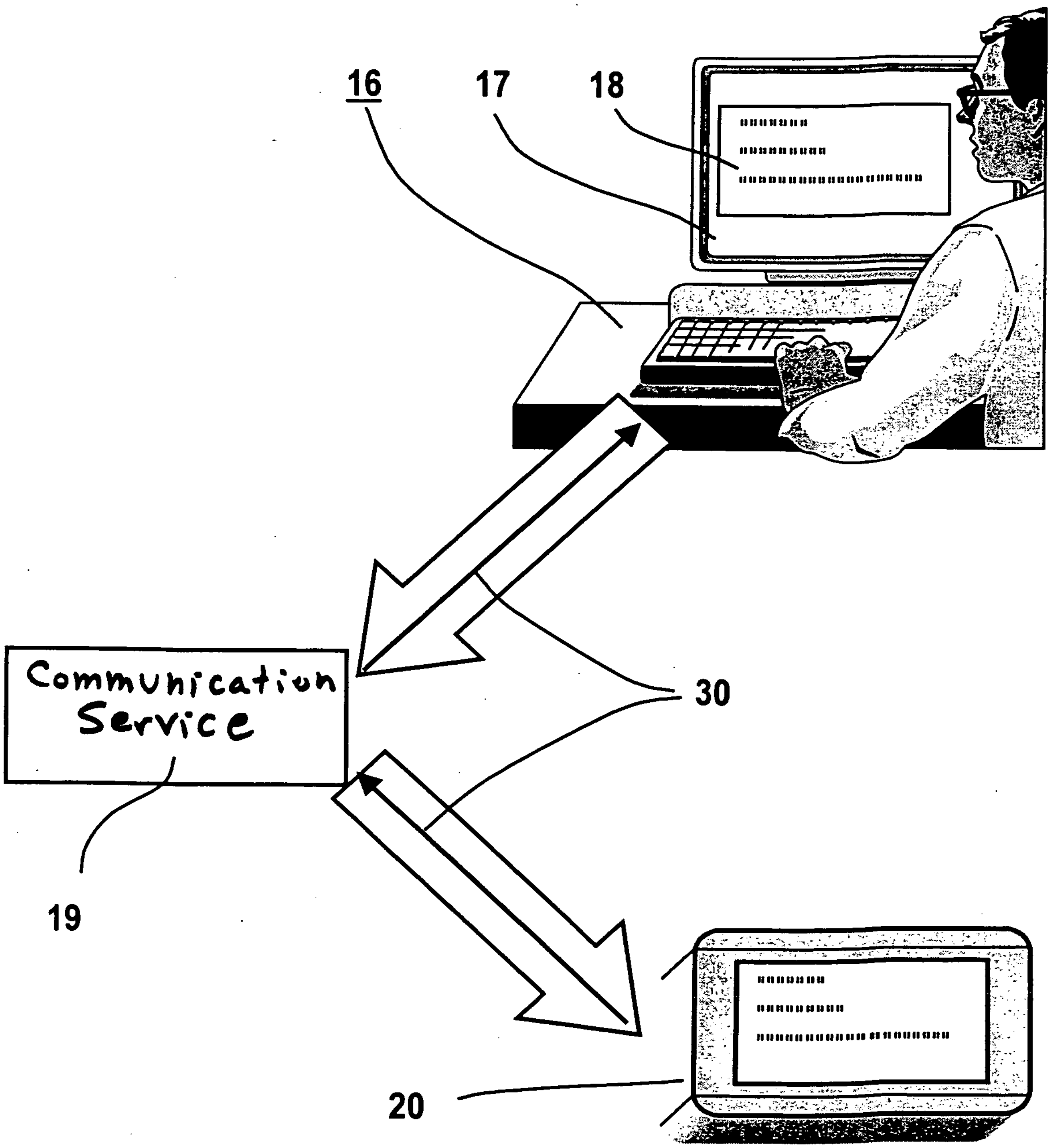

FIG 2

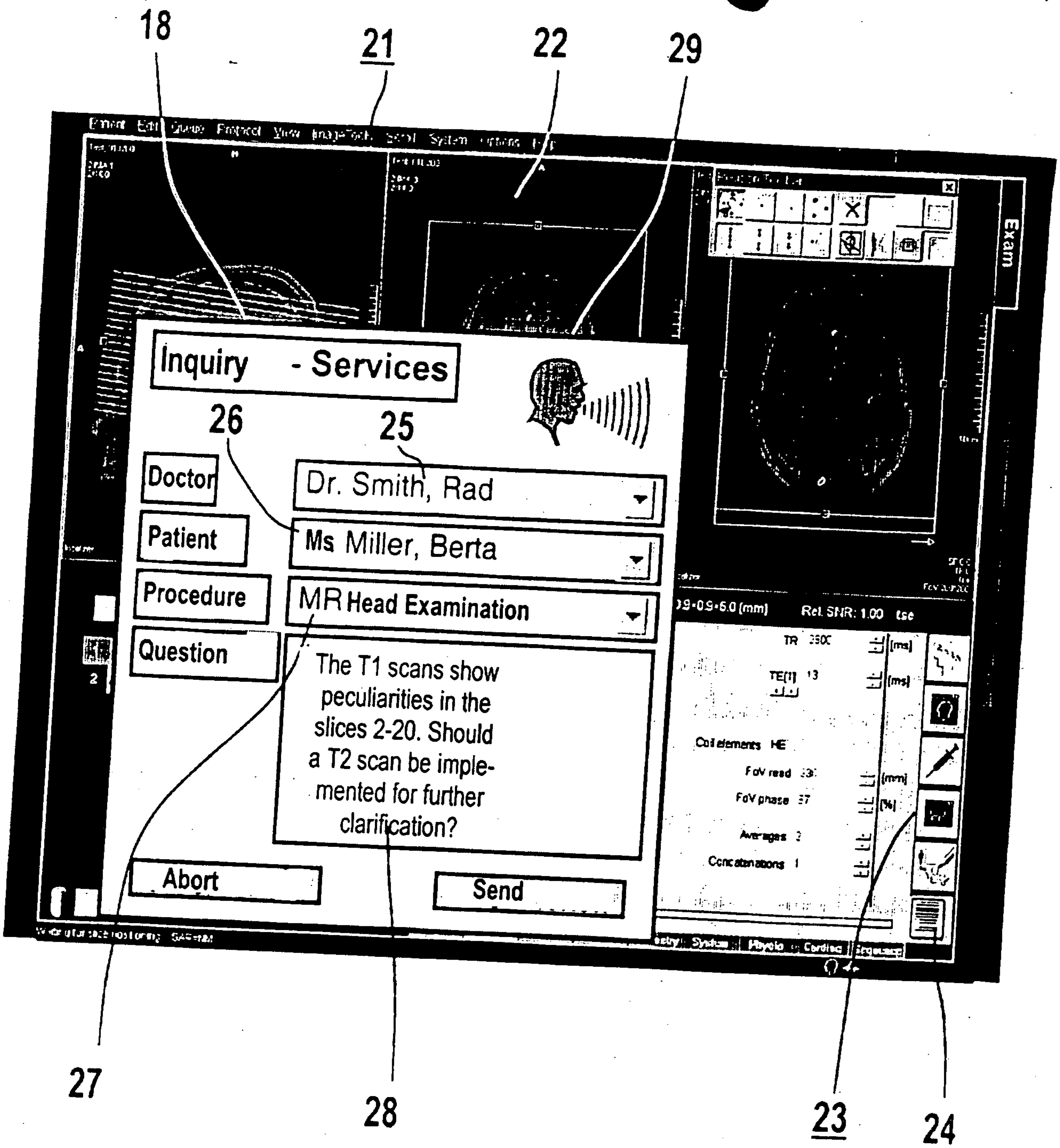
18
21
22
29
Inquiry - Services
26
25
Doctor
Dr. Smith, Rad
Patient
Ms Miller, Berta
Procedure
MR Head Examination
Question
The T1 scans show peculiarities in the slices 2-20. Should a T2 scan be implemented for further clarification?
Abort
Send
Exam
Rel. SNR: 1.00
27
28
23
24

FIG 3